IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re patent application of:	) MMB Docket No.: **1776-0013**
Inventor: **Steven D. Bush**	) Xerox Docket No.: **D/A 1346-US-NP**
Application No.: **10/759,970**	) Examiner: **David P. Turocy**
Filed: **January 16, 2004**	) Group Art No.: **1792**
For: **Dip Coating Process Using Viscosity To Control Coating Thickness**	) Confirmation No.: **8323**

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BRIEF ON APPEAL

(1) REAL PARTY IN INTEREST

Xerox Corporation of Norwalk, Connecticut is the assignee of this patent application, and the real party in interest.

(2) RELATED APPEALS AND INTERFERENCES

There are no appeals or interferences related to this application serial number 10/759,970.

(3) STATUS OF CLAIMS

Claims 1-16 have been previously canceled and claims 17-20 have been withdrawn and are not involved in this appeal. Claims 21-36 are pending in the application, have been twice rejected, and are the subject of this appeal.

Each of the appealed claims 21-36 is shown in the Claims Appendix attached to this Appeal Brief.

(4) STATUS OF AMENDMENTS

Appellant has filed no amendments subsequent to the Final Office Action mailed November 7, 2008.

(5) SUMMARY OF CLAIMED SUBJECT MATTER

Independent claim 21 is directed to a method of manufacturing a photoreceptor. The method includes pumping a charge transfer layer ("CTL) solution into a tube via a CTL solution inlet in the tube (Specification, page 26, lines 1-7; FIG. 2, reference number 14). The CTL solution has an initial viscosity and the tube has an upper opening positioned above the CTL solution inlet in the tube and sized to receive a substrate therethrough, the upper opening being configured to act as a solution outlet for the tube, the CTL solution being pumped through the tube from the CTL solution inlet to the CTL solution outlet at an intial pump speed selected to generate a predetermined vertical flow rate of the CTL solution in the tube (Specification, page 26, lines 4-13; page 32, lines 14-20; page 33, lines 14-18). A substrate is inserted through the upper opening and is at least partially submerged in the CTL solution in the tube (Specification, page 10, lines 3-20). The substrate is withdrawn from the tube at a predetermined pull rate as the CTL solution is pumped through the tube at the predetermined vertical flow rate, the predetermined pull rate and the predetermined vertical flow rate being selected in accordance with the initial viscosity of the CTL solution to provide a differential rate that enables a CTL coating to be deposited on the substrate at a target thickness (Specification, page 14, lines 17-20; page 30, line 12 to page 31, line 2; page 33, lines 14-18). The viscosity of the CTL solution is measured as the substrate is being withdrawn from the tube (Specification, page 30, lines 1-2; page 32, lines 21-22). The initial pump speed is adjusted to generate an adjusted vertical flow rate of the CTL solution in the tube in

response to deviations of the measured viscosity from the initial viscosity as the substrate is being withdrawn from the tube. The adjusted vertical flow rate is selected in accordance with a magnitude of the deviations and the predetermined pull rate to provide an adjusted differential rate to maintain the target thickness of the CTL coating on the substrate as the substrate is withdrawn from the tube (Specification, page 8, lines 16-19; page 21, lines 20-23; page 26, line 8 to page 27, line 10; page 31, lines 8-19; page 35, lines 1-6).

Independent claim 30 is directed to a method of controlling the thickness of a coating layer on an article. The method includes dipping an article in a dip tank, the dip tank being filled with a coating solution having an initial viscosity (Specification, page 9, line 18 to page 10, line 2; page 32, lines 14-16). The coating solution is pumped through the tank from a lower portion to an upper portion of the tank such that the coating solution has an initial vertical flow rate (Specification, page 32, lines 14-16). The article is withdrawn from the dip tank at a pull rate to form a coating layer on the article, said pull rate and said initial vertical flow rate exhibiting a differential rate, a thickness of the coating layer corresponding to the differential rate and a viscosity of the coating solution, the initial vertical flow rate and the pull rate being selected in accordance with the initial viscosity to generate a coating layer on the article having a target thickness (Specification, page 33, lines 14-18). An actual viscosity of the coating solution is detected as the article is withdrawn from the dip tank (Specification, page 32, line 21 to page 33, line 13). The vertical flow rate of the coating

solution is adjusted from the initial vertical flow rate to an adjusted vertical flow rate in response to the detected viscosity deviating from the initial viscosity, the adjusted vertical flow rate causing an adjusted differential rate, the adjusted differential rate being selected in accordance with the pull rate and the detected deviating viscosity to maintain the target thickness of the coating layer (Specification, page 8, lines 16-19; page 21, lines 20-23; page 26, line 8 to page 27, line 10; page 31, lines 8-19; page 35, lines 1-6).

(6) GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

The first ground of rejection to be reviewed on appeal is whether claims 21 and 24-30 are unpatentable under 35 U.S.C. 103(a) over Mistrater (U.S. Patent No. 5,681,391) in view of Pinsly (U.S. Patent No. 6,180,310) and Cai (U.S. Patent No. 6,270,850).

The second ground of rejection to be reviewed on appeal is whether claims 22-23 and 31-36 are unpatentable under 35 U.S.C. 103(a) Mistrater in view of Pinsly and Cai and in further view of Langlois et al. (U.S. Patent No. 5,149,612).

(7) ARGUMENT

The rejected claims 21-36 stand or fall together.

A. A FOUNDATIONAL FINDING OF FACT IS UNSUPPORTED BY THE PINSLEY REFERENCE AS ASSERTED BY THE EXAMINER

The Examiner has failed to make findings of fact that are properly supported by the cited Pinsley reference.

> Finding of Fact: Pinsly is cited as a teaching that it is known in the art that variations in coating thickness are directly linked to the variations in the viscosity of the coating solution. *Office Action*, page 4, lines 2-4.

This finding of fact is not supported by the cited Pinsly reference and, consequently, no *prima facie* case of obviousness has been made.

Discussion of the Finding of Fact

Pinsly addresses the problem of streaks occurring in a coating because the viscosity of a coating solution reaches a threshold where streaks appear in the coating. *Pinsly*, col. 6, lines 45-54. Streaks are described as being axial or circumferential non-uniformities. *Pinsly*, col. 1, lines 56-67. These non-uniformities appear to be irregular distributions of the particulate photoconductive material, not thickness variations. By keeping the viscosity of a coating solution between an initial viscosity level and a maximum level that is less than the threshold level, the coating does not develop streaks. *Pinsly*, col. 6, line 55 to col. 8, line 10. Thus, Pinsly does not teach that variations in coating *thickness* are directly related to variations in viscosity and, therefore, the finding of fact regarding the teachings of Pinsly is wrong.

The Examiner's citation to col. 2, lines 5-11 glosses over the specific teachings

noted above. What Pinsley states at the cited portion is that variations in CTL viscosity *along with* sudden and small changes in CTL flow rate *and* other mechanisms affect coating material thickness. The portion of Pinsley in column 1 noted above indicates that viscosity changes are responsible for streaks. Streaks are a form of thickness variation, but Pinsley is far from teaching that changes in viscosity can vary coating thickness uniformly. Hence, the Pinsley reference does not support the Examiner's position that Pinsley teaches that viscosity may be controlled to affect coating thickness uniformly.

What Pinsly explicitly teaches is that the appearance of axial and circumferential streaks is directly related to the coating solution viscosity reaching a threshold level. This streaking is prevented by operating a coating process within a predetermined viscosity range, which is below the threshold level. With regard to coating thickness, Pinsly unequivocally teaches that coating solution flow rate changes cause coating material thickness variations, that these variations are undesirable, and that the flow rate of coating solution should be substantially constant. *Pinsly*, col. 2, lines 5-15; col. 10, lines 14-21. Thus, Pinsly discloses that streaks are addressed by keeping coating solution viscosity in a predetermined range below the threshold, *and* that coating thickness variations and the undesirable effects of such variations are prevented by keeping coating solution flow rate constant. Consequently, Pinsly does not teach that viscosity can be controlled to control a coating thickness uniformly and it teaches away from any useful purpose for varying the flow rate of the coating solution.

<u>B. NO EVIDENCE HAS BEEN CITED FOR THE FINDING OF FACT THAT ONE OF ORDINARY SKILL IN THE ART WOULD LEAP OVER THE DIFFERENCES BETWEEN THE PRIOR ART AND THE CLAIMED INVENTION TO ARRIVE AT THE CLAIMED INVENTION.</u>

<u>Discussion of the Cai Reference</u>

With regard to Cai, the Examiner's comment regarding the relationship between coating thickness and the viscosity and speed of the coating solution appears to

be made with reference to the formula disclosed in Cai at col. 4, line 35, which is a well known formula in the art. *Cai*, col. 3, lines 39-48. That formula, according to Cai, may be used to determine a coating speed once a wet coating thickness is selected, a proportionality constant empirically determined for the coating solution and selected wet coating thickness, and the viscosity, density, and surface tension have been measured for a particular coating scenario. *Cai*, col. 4, lines 7-43.

With these preliminary process conditions determined, Cai selects a gap size between the substrate being coated and the wall along which the coating solution flows. This gap must enable the coating solution to remain at a stress shear that is greater than a yield stress. *Cai*, col. 3, lines 34-41. The gap is selected with additional calculations made for the coating scenario conditions determined from the equation noted above. *Cai*, col. 4, line 53 to col 5, line 38. Determining whether a solution is thixotropic or non-thixotropic is also important as this property affects the stability of the yield stress level. *Cai*, col. 2, line 44 to col. 3, line 33. Once the proper gap for a set of particular process parameters has been selected, the process may be performed in accordance with those parameters without substantial risks of adverse effects. Cai states the purpose of the disclosure succinctly when he says, "Thus, by selecting the appropriate gap distance *for a given set of dip coating parameters*, the present invention ensures a sufficient shear rate that breaks up flocculates, minimizes vortices and stagnation areas in solutions during the coating process, especially unstable (in the rheological sense), non-Newtonian solutions." *Cai*, col. 8, lines 40-45 (emphasis added).

Cai discloses no process for adjusting or compensating for changes to parameter values occurring during the process. Cai does disclose that once a coating speed has been determined for a particular set of parameters, the determined coating speed may be varied to alter the thickness of the coating.

Cai, col. 4, lines 49-53. No corresponding change in viscosity is disclosed in this section so Cai is not teaching that coating solution speed changes are related to viscosity changes or *vice versa*. Instead, Cai is only teaching that if all other process parameters remain the same, speed can be varied to alter coating thickness. Consequently, the Examiner's conclusion (*Office Action*, p. 4, lines 5-12) that modification of pumping speed or viscosity in response to a change in the other characteristic (viscosity or speed, respectively) to achieve desired results is not supported by the references. Specifically, Pinsly teaches that streaking can be avoided by monitoring viscosity of a coating solution and restoring the viscosity to an initial level in response to the viscosity reaching a predetermined maximum. Cai teaches that selection of a gap distance for a given set of process parameters (speed and viscosity among the parameters) helps maintain coating level uniformity. Nothing in either of these references teaches or suggests the monitoring of one coating characteristic and adjusting another coating characteristic to compensate for a change in the first coating characteristic.

Only one source of information can make the Examiner's leap from the formula of Cai to the invention set forth in Applicant's claims. That source is the Applicant's specification. That source, however, is not available to the Examiner. Consequently, the section 103 ground of rejection is unsupported and must fall.

CONCLUSION

As set forth above, the Pinsley reference does not support the Examiner's finding of fact and the Cia reference cannot be combined with the Pinsely reference to arrive at the claimed invention without recourse to Applicant's specification. Thus, the Examiner has failed to present a *prima facie* case of obviousness for the grounds of rejection of claims 21-36. The Board of Appeals, therefore, is respectfully requested to reverse the rejection of pending claims 21-36.

Respectfully submitted,
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(8) CLAIMS APPENDIX

21. (Previously presented) A method of manufacturing a photoreceptor comprising:

pumping a charge transfer layer ("CTL") solution into a tube via a CTL solution inlet in the tube, the CTL solution having an initial viscosity, the tube having an upper opening positioned above the CTL solution inlet in the tube and sized to receive a substrate therethrough, the upper opening being configured to act as a solution outlet for the tube, the CTL solution being pumped through the tube from the CTL solution inlet to the CTL solution outlet at an initial pump speed selected to generate a predetermined vertical flow rate of the CTL solution in the tube;

inserting the substrate through the upper opening and at least partially submerging the substrate in the CTL solution in the tube;

withdrawing the substrate from the tube at a predetermined pull rate as the CTL solution is pumped through the tube at the predetermined vertical flow rate, the predetermined pull rate and the predetermined vertical flow rate being selected in accordance with the initial viscosity of the CTL solution to provide a differential rate that enables a CTL coating to be deposited on the substrate at a target thickness;

measuring a viscosity of the CTL solution as the substrate is being withdrawn from the tube; and

adjusting the initial pump speed to generate an adjusted vertical flow rate of the CTL solution in the tube in response to deviations of the measured

viscosity from the initial viscosity as the substrate is being withdrawn from the tube, the adjusted vertical flow rate being selected in accordance with a magnitude of the deviations and the predetermined pull rate to provide an adjusted differential rate to maintain the target thickness of the CTL coating on the substrate as the substrate is withdrawn from the tube.

22. (Previously presented) The method of claim 21, the pumping of the CTL solution further comprising:

pumping the CTL solution through the tube using a motor driven pump having a variable speed controller, the variable speed controller being configured to control an angular velocity of the motor driven pump to generate the predetermined vertical flow rate.

23. (Previously presented) The method of claim 22, the adjustment of the initial pump speed further comprising:

adjusting the angular velocity of the motor driven pump via the variable speed controller to generate the adjusted vertical flow rate.

24. (Previously presented) The method of claim 21, further comprising:

adjusting the adjusted pump speed to modify the adjusted vertical flow rate of the CTL solution back to the predetermined vertical flow rate in response to the measured viscosity corresponding to the initial viscosity.

25. (Previously presented) The method of claim 24, the adjustment of the initial pump speed to generate an adjusted vertical flow rate in response to deviations of the measured viscosity from the initial viscosity further comprising:

increasing the initial pump speed to an upper adjusted pump speed in response to the measured viscosity being greater than the initial viscosity; and

decreasing the initial pump speed to a lower adjusted pump speed in response to the measured viscosity being less than the initial viscosity.

26. (Previously presented) The method of claim 25, the increasing and decreasing of the initial pump speed further comprising:

increasing the initial pump speed to an upper adjusted pump speed in response to the measured viscosity being greater than the initial viscosity by a first threshold amount; and

decreasing the initial pump speed to a lower adjusted pump speed in response to the measured viscosity being less than the initial viscosity by a second threshold amount.

27. (Previously presented) The method of claim 26, the first and the second threshold amounts being between approximately 5 and approximately 30 centipoise.

28. (Previously presented) The method of claim 26, the upper adjusted pump speed being approximately 3% greater than the initial pump speed, and the lower adjusted pump speed being approximately 3% less than the initial pump speed.

29. (Previously presented) The method of claim 21, the substrate comprising a photoreceptor drum.

30. (Previously presented) A method of controlling the thickness of a coating layer on an article, the method including:

dipping an article in a dip tank, the dip tank being filled with a coating solution having an initial viscosity;

pumping the coating solution through the tank from a lower portion to an upper portion of the tank such that the coating solution has an initial vertical flow rate;

withdrawing the article from the dip tank at a pull rate to form a coating layer on the article, said pull rate and said initial vertical flow rate exhibiting a differential rate, a thickness of the coating layer corresponding to the differential rate and a viscosity of the coating solution, the initial vertical flow rate and the pull rate being selected in accordance with the initial viscosity to generate a coating layer on the article having a target thickness;

detecting an actual viscosity of the coating solution as the article is withdrawn from the dip tank; and

adjusting the vertical flow rate of the coating solution from the initial vertical flow rate to an adjusted vertical flow rate in response to the detected viscosity deviating from the initial viscosity, the adjusted vertical flow rate causing an adjusted differential rate, the adjusted differential rate being selected in accordance with the pull rate and the detected deviating viscosity to maintain the target thickness of the coating layer.

31. (Previously presented) The method of claim 30, the pumping of the coating solution further comprising:

pumping the coating solution through the dip tank using a motor driven pump having a variable speed controller, the variable speed controller being configured to control an angular velocity of the motor driven pump to generate the initial vertical flow rate and the adjusted vertical flow rate.

32. (Previously presented) The method of claim 31, further comprising:

adjusting the angular velocity of the pump to modify the adjusted vertical flow rate of the coating solution back to the initial vertical flow rate in response to the detected viscosity corresponding to the initial viscosity.

33. (Previously presented) The method of claim 32, the adjustment of the angular velocity of the pump to generate an adjusted vertical flow rate further comprising:

increasing the angular velocity of the pump to an upper adjusted pump angular velocity in response to the detected viscosity being greater than the initial viscosity; and

decreasing the angular velocity of the pump to a lower adjusted pump angular velocity in response to the detected viscosity being less than the initial viscosity.

34. (Previously presented) The method of claim 33, the increasing and decreasing of the pump angular velocity further comprising:

increasing the angular velocity of the pump to an upper adjusted pump angular velocity in response to the detected viscosity being greater than the initial viscosity by a first threshold amount; and

decreasing the angular velocity of the pump to a lower adjusted pump angular velocity in response to the detected viscosity being less than the initial viscosity by a second threshold amount.

35. (Previously presented) The method of claim 34, the first and the second threshold amounts being between approximately 5 and approximately 30 centipoise.

36. (Previously presented) The method of claim 35, the upper adjusted pump angular velocity being approximately 3% greater than the initial pump angular velocity, and the lower adjusted pump angular velocity being approximately 3% less than the initial pump angular velocity.

(9) EVIDENCE APPENDIX

No evidence was submitted under rules 1.130, 1.131, or 1.132. Additionally, no other evidence has been entered in the record by the Examiner upon which the Applicant relies.

(10) RELATED PROCEEDINGS APPENDIX

No proceedings were identified in the Related Appeals and Interferences presented above. Therefore, no decisions of a court or the Board are contained herein.